REMARKS

By this Amendment, claim 8 is amended. Claims 9 and 12-15 remain in the application. Thus, claims 8-9 and 12-15 are active in the application. Reexamination and reconsideration of the application are respectfully requested.

In item 2 on page 2 of the Office Action, claims 8-9 and 12-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Konno (JP 07162990, previously identified as Konno) in view of Olsson (U.S. 5,913,178).

Without intending to acquiesce to this rejection, independent claim 8 has been amended to more clearly illustrate the marked differences between the present invention and the applied references. Accordingly, the Applicant respectfully submits that the present invention is clearly patentable over the applied references for the following reasons.

The present invention provides a speaker apparatus comprising an amplifier which is operable to receive an input signal and to output an amplified signal, a speaker unit which is operable to reproduce the amplified signal and to radiate an acoustic output signal, and an acoustic pipe mounted in the front of the speaker unit. The speaker apparatus of the present invention also comprises a microphone disposed in the acoustic pipe, where the microphone is operable to detect the acoustic output signal radiated from the speaker unit, and a feedback circuit which is operable to feed the acoustic output signal detected by the microphone back to an input side of the amplifier.

Since the acoustic output signal is detected by the microphone disposed in the acoustic pipe, the microphone is susceptible to resonance caused by standing waves occurring in the acoustic pipe or by standing waves due to the length of the acoustic pipe. If the microphone detects such resonance generated in the acoustic pipe, the microphone will resultantly feed such resonance back to the amplifier.

Conventional speaker apparatuses have been developed where sound absorbing material are disposed on the inner walls of the acoustic pipe and where the microphone is located in front of and close to the speaker unit, but even with such a construction, the microphone still detects acoustic outputs of a second and/or higher resonance generated in the acoustic pipe and a resonance generated in a closed space of the acoustic pipe which is orthogonal to the longitudinal direction of the acoustic pipe. Thus, such

resonance detected by the microphone is fed back to the amplifier and is resultantly output by the speaker unit. Furthermore, the cost of the speaker apparatus increases by disposing sound absorbing material on the inner walls of the acoustic pipe even though the incorporation of the sound absorbing material does not prevent the microphone from detecting the second and/or higher resonance and the resonance generated in the closed space of the acoustic pipe that is orthogonal to the longitudinal direction of the acoustic pipe.

Therefore, to address the problems of conventional speaker apparatuses, the present invention provides a speaker apparatus in which the microphone does not detect a second and higher (third) resonance generated in the acoustic pipe and a resonance generated in a closed space of the acoustic pipe which is orthogonal to the longitudinal direction of the acoustic pipe.

To achieve this feature of the present invention, the microphone is placed at a position where sound pressure of resonance occurring in a longitudinal direction, in a latitudinal direction orthogonal to the longitudinal direction, and in a direction orthogonal to both the longitudinal direction and the latitudinal direction of the acoustic pipe is low enough so as not to cause oscillation.

Moreover, the microphone is placed at a position where sound pressure of a second and third pipe resonance in the longitudinal direction, in the latitudinal direction and in the direction orthogonal to both the longitudinal direction and the latitudinal direction of the acoustic pipe is low enough so as not to cause oscillation, and where at least sound pressure of a resonance occurring in a closed space of the acoustic pipe is low enough so as not to cause oscillation.

Accordingly, the present invention places the microphone with consideration to the pipe resonance of three dimensional directions. In particular, the microphone of the present invention suppresses second and third pipe resonance of three dimensional directions of the acoustic pipe (longitudinal, latitudinal and orthogonal to the longitudinal and latitudinal directions). Since the present invention is directed to a speaker system, where the output frequency ranges at least between 20 Hz and 20KHz, and sometimes as high as 100 kHz, it is important to address both the second and third pipe resonance. In fact, in contrast to microphone signals in GSM telephone systems, for example, it is

important to suppress the third pipe resonance in the present invention due to the above-described frequency ranges. Accordingly, both the second and third pipe resonance are suppressed in the present invention by the selection of a proper position of the microphone in a three-dimensional space.

Claim 8 recites the above-described features of the present invention. In particular, claim 8 recites that the microphone is placed at a position where sound pressure of resonance occurring in a longitudinal direction, in a latitudinal direction orthogonal to the longitudinal direction, and in a direction orthogonal to both the longitudinal direction and the latitudinal direction of the acoustic pipe is low enough so as not to cause oscillation.

Furthermore, claim 8 recites that the microphone is placed at a position where sound pressure of a second and third pipe resonance in the longitudinal direction, in the latitudinal direction and in the direction orthogonal to both the longitudinal direction and the latitudinal direction of the acoustic pipe is low enough so as not to cause oscillation, and where at least sound pressure of a resonance occurring in a closed space of the acoustic pipe is low enough so as not to cause oscillation.

As acknowledged by the Examiner, Konno does not disclose, suggest or even contemplate a second and third pipe resonance of an acoustic tube disposed in front of a speaker unit. Konno is only concerned with the placement of a microphone in a longitudinal direction of the acoustic pipe.

To teach this feature, the Examiner applied Olsson and asserted that it would have been obvious to modify Konno with Olsson to select the position of a microphone for minimizing at least one of a second and third pipe resonance in the longitudinal direction, in the latitudinal direction and in the direction orthogonal to both the longitudinal and latitudinal directions of the of the acoustic pipe so as not to cause oscillation. However, the Applicant respectfully submits that the speaker apparatus of claim 8 is markedly different from Olsson for the following reasons.

First, Olsson discloses a thin linear pipe extending only in the longitudinal direction. Thus, Olsson merely aims to reduce a one-dimensional pipe resonance (i.e., in the longitudinal direction).

On the contrary, as described above, claim 8 suppresses the pipe resonance of three dimensional directions, i.e., in a longitudinal direction, in a latitudinal direction orthogonal to the longitudinal direction, and in a direction orthogonal to both the longitudinal direction and the latitudinal direction of the acoustic pipe.

Second, although Olsson discloses the suppression of the first and second pipe resonance of the acoustic pipe, Olsson does not disclose or suggest a reduction of a third pipe resonance. As is clearly shown in Figure 4 and disclosed in Column 4, lines 23-25, the third resonance sharply rises at the peak 13.

Moreover, Olsson does not attempt to suppress the third pipe resonance because a microphone signal in the GSM telephone system does not use a frequency spectrum beyond 4 kHz (column 4, lines 10-11), and the acoustic pipe of Olsson is used only in the telephone system.

On the contrary, as described above, claim 8 suppresses the second and third pipe resonance of three dimensional directions. This is because, as described above, in the speaker system of the present invention, the output frequency ranges at least between 20 Hz and 20 kHz, and sometimes as high as 100 kHz. Accordingly, it is important to suppress the third pipe resonance in addition to suppressing the second pipe resonance.

Third, although Olsson discloses the attenuation of the second pipe resonance, Olsson does not disclose or suggest the simultaneous suppression of the first and second pipe resonance according to the specific positioning of the microphone. With regard to the suppression of the first pipe resonance, Olsson utilizes an attenuation material inside the sound guide to suppress the first resonance (Column 3, lines 47-63).

On the contrary, as described above, claim 8 suppresses both the second and third pipe resonance of three dimensional directions by the specific three-dimensional positioning of the microphone.

Accordingly, for at least the foregoing reasons, Olsson clearly does not disclose or suggest that the microphone is placed at a position where sound pressure of a second and third pipe resonance in the longitudinal direction, in the latitudinal direction and in the direction orthogonal to both the longitudinal direction and the latitudinal direction of the acoustic pipe is low enough so as not to cause oscillation, and where at least sound

pressure of a resonance occurring in a closed space of the acoustic pipe is low enough so as not to cause oscillation, as recited in claim 8.

Accordingly, similar to Konno, Olsson clearly does not disclose or suggest each and every limitation of claim 8. Therefore, no obvious combination of Konno and Olsson would result in the invention of claim 8 since Konno and Olsson, either individually or in combination, clearly fail to disclose or suggest each and every limitation of claim 8.

Therefore, for at least the foregoing reasons, claim 8 is clearly patentable over Konno and Olsson.

Furthermore, it is submitted that the clear distinctions discussed above are such that a person having ordinary skill in the art at the time the invention was made would not have been motivated to modify Konno and Olsson in such as manner as to result in, or otherwise render obvious, the present invention as recited in claim 8.

Therefore, it is submitted that the claim 8, as well as claims 9 and 12-15 which depend therefrom, are clearly allowable over the prior art as applied by the Examiner.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is respectfully solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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